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ABSTRACT

This paper describes the results and implications of an investigation, based on dissonance theory, into attitude formation in introductory college science courses. The results of the study show that students who learned in ways they preferred registered a more positive attitude toward the course than did those who learned in ways they did not prefer. Course preference was not found to be related to achievement. Dissonance is experienced by students enrolled in a course in which they feel unsuccessful. Acquiring a negative attitude toward the course represents a natural move on a student's part to reduce dissonance by reducing the importance of achievement in the course. The paper adds that when students are provided with instructional experiences compatible with the manner in which they prefer to learn, dissonance is reduced, and course attitude is improved as the negative effects of achievement are somewhat counterbalanced. (GA)

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Attitude Formation In Introductory Science Courses:

An Application of Dissonance Theory

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Introduction

The subject of attitude formation and change represents an area of growing concern among science educators. At the 1977 Annual NARST Meeting, a report was distributed "Priorities for Research in Science Education", prepared by an ad hoc committee of NARST and NIE. This report reaffirms the need to explore the impact of attidues upon the process of decision making. An examination of the literature dealing with attitude formation and change reveals numerous theoretical models. Four approaches appear to offer promise for researchers investigating attitudes in the context of science education (Shrigley, 1977); they are:

a. cognitive dissonance
b. perceptual theory
c. communication theory
d. functional approach

The purpose of this paper is to describe the results and implications of an investigation, based on dissonance theory, into attitude formation in introductory college science courses.

Definition of Attitude

As pointed out by Allport (1935) and Dawes (1973) attitudes are more easily measured than defined. However, any researcher attempting to investigate attitudes has an obligation to not only know what it is he is measuring but also communicate it to others in an intelligible fashion. That this presents difficulty is readily seen upon examining the seven definitions of attitude presented by Greenwald (1968, p. 362). In vain he attempts to clarify what is meant by attitude by supplying the reader with at best another equally vague definition (p. 386). To researchers interested in consistency theories, e.g. cognitive dissonance, Klausmeier (in Ringness, 1975) offers perhaps the most

appealing definition of attitude. According to Klausmeier, attitudes are emotionally toned predispositions to react in a consistent way, favorably or unfavorably, toward a person, object, or idea.

Attitude and Behavior

The origin of the concept attitude is found in research focusing on human behavior: experimental psychologists wanted to explain differences in individual behavior; psychoanalysts, differences in individual emotional behavior; and sociologists, differences in individual reactions to social structure (Liska, 1975). Experimental results have been inconsistent, establishing only a weak link between attitude and behavior. In an effort to gain increased control of the possible outcomes, experiments have not only designed test situations with a rather "play like" atmosphere, but have introduced measurement techniques of questionable validity (Liska, 1975). After a rather extensive search of the literature relating attitude change to behavior, Festinger (1975) located only three relevant studies.

Dissonance Theory

Of all the theories of attitude change, cognitive dissonance has generated the most experimental work; its attractiveness lies not only in its simplicity, but also in its ability to predict seemingly illogical consequences. It differs uniquely from other consistency theories in many ways; among these are the way it defines consistency, allows for varying degrees of inconsistency, and provides for inconsistency reduction (Kiesler, 1969).

Festinger (1957) proposed that dissonance exists whenever there are non-fitting relations among a person's cognitions, that is, what a person knows or believes about the environment, about himself, or about his behavior. Two elements are non-fitting when, according to Festinger, considering the two alone, the obverse of one element would follow from the other. In the context of instruction a state of dissonance exists

when a student expecting to pass a course in which he is enrolled fails to get passing grades or preferring to learn by one teaching method learns that the instructor does not teach using that method. In both cases the obverse of one element follows from the other. The existence of dissonance, being psychologically uncomfortable, motivates the person to not only try to reduce the dissonance and achieve consonance but to avoid situations (or information) likely to increase it. In short, cognitive dissonance theory is largely concerned with man's attempt to justify his own behavior -- to make his actions appear to be reasonable and rational after the fact (Aronson, 1969).

Cognitive Dissonance and Introductory College Science Courses

One study recently reported (Crawley and Shrum, 1977) that students learning in ways they preferred registered a more positive attitude toward the course than did those who learned in ways they did not prefer. Students (153) participating in the study were enrolled in introductory college science courses in biology, chemistry, geology, and physics at the University of Georgia during the Winter quarter, 1975. Pre and post-measures of preference for the science course in which a student was enrolled were obtained using the Subject Preference Scale (SPS). Markle and Capie (1974) have reported extremely favorable consistency and reliability data for the SPS. Whether or not a student was learning in a way he preferred was determined upon completion of the course using the Structural Compatibility Inventory (SCI). The SCI instrument offers a means of determining whether or not a student is learning in preferred ways by comparing his perception of the existing learning structure with the structure he prefers. Crawley and Shrum (1976) have reported the test-retest stability of students' perceptions and preferences respectively to be 0.65 and 0.82.

The outcome of the study was not conclusive. Results of statistical tests showed that students enrolled in introductory college physics who learned in compatible ways -- perception identical to preference -- increased their preference for physics significantly ($t_{21} = 3.25$, $p < .01$)

more than their counterparts who learned in ways not compatible with their needs. Gains in preference for their respective courses were not found to be significantly greater for biology, chemistry, and geology students who learned in preferred ways when compared with those learning in ways not preferred.

Dissonance theory offers, perhaps, an insight into the significance of the findings with the physics group. Students learning in ways incompatible with their needs experience dissonance. To feel the need for a highly structured learning environment in order to succeed in physics and yet be expected to learn in one which is unstructured, or vice versa, is psychologically uncomfortable. The cognitions are non-fitting, according to dissonance theory, since the obverse of one would follow from the other. The alternatives available to the student who finds himself in such a delimma are to change either his behavior or his cognition, or add new cognitive elements. Should the student elect not to attend class (change his behavior), he most likely will still not achieve consonance, as important information will probably be given which is necessary for successful completion of an assignment; the result is the student acquires a negative attitude (cognition) toward the course. Should he decide to try the unstructured method with the belief that it is really the best way to learn (change his cognition) and not succeed, he reinforces with every failure his original cognition; his attitude toward the course may become quite negative. Regardless of whether he decides to cut out of class or stay and be content, the student will probably seek out information which reinforces his course of actions, e.g. I like the content; I like the instructor. Success in any one or all of these courses of action and/or his ability to withstand the psychological discomfort of dissonance may have a pronounced effect upon the resultant attitude (cognition) the student acquires.

Conclusions and Recommendations

In view of the variety of learning experiences a student may be exposed to in science classrooms, there is great potential for all students to develop positive attitudes. Teaching method, however, may not be the

only variable affecting course attitude; the instructor and the course content most certainly influence a student's attitude toward a science course. Compatibility between a student's need regarding learning method, the instructor, and the content implies consonance. Course attitude will most likely be positive. In order to assess the extent of compatibility/incompatibility (consonance/dissonance) between a student's needs and each of the course components (instructor, method, and content), an instrument is needed if further research is to be conducted into dissonance and its effects on course attitude.

Students enrolled in introductory college science courses possess a variety of interests, degree objectives, learning needs, and personalities. For a course to truly meet the needs of such a diverse group, it should not only offer content relevant to the degree aspirations of its students but should be taught by instructors capable of appealing to a variety of personality types and learning needs.

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